CLAIMS

1. (Currently amended) A method of demodulating an ultra-wideband communication signal, the method comprising the steps of:

receiving an incoming signal, wherein the incoming signal comprises a plurality of ultra-wideband pulses;

approximating the incoming signal;

generating a local signal;

generating a first output signal and a second output signal;

quantizing the first output signal and the second output signal to produce a first quantized signal and a second quantized signal;

generating a difference signal [[for]] from the first quantized signal and the second quantized signal; and

providing an error signal based on the difference signal.

2. (Original) The method of claim 1, wherein the step of generating a local signal uses a phase-locked loop.

3. (Original) The method of claim 2, wherein the phase-locked loop is gated.

4. (Original) The method of claim 3, wherein the phase-locked loop is gated by the incoming signal.

5. (Original) The method of claim 1, wherein the step of generating a first output signal and a second output signal comprises:

filtering the local signal to produce a first duplicate signal and a second duplicate signal.

6. (Currently amended) The method of claim 5, wherein the filtering uses at least one [[a plurality of]] low-pass [[filters]] filter.

7. (Canceled)

8. (Currently amended) The method of claim [[7]] 6, wherein [[the]] a cut-off frequency of the at least one low-pass filter is approximately 3 gigahertz.

9. (Original) The method of claim 5, wherein the filtering uses a matched filter.

10. (Original) The method of claim 9, wherein the matched filter comprises a band-pass filter.

11. (Original) The method of claim 10, wherein a passband of the band-pass filter is approximately 3 gigahertz.

12. (Original) The method of claim 11, wherein a center frequency of the passband is approximately 5 gigahertz.

13. (Original) The method of claim 10, wherein a transfer function of the bandpass filter approximates a transfer function of an ultra-wideband transmitter transmitting the incoming signal.

14. (Original) The method of claim 1, wherein the generating a first output signal and a second output signal comprises:

multiplying a first duplicate signal and the incoming signal to produce a first output signal.

15. (Original) The method of claim 14, wherein the step of generating a first output signal and a second output signal comprises:

delaying a phase of a second duplicate signal to produce a delayed phase signal.

16. (Original) The method of claim 15, wherein the step of delaying uses a delay circuit from the group consisting of a 90-degree phase delay circuit and a 270-degree phase delay circuit.

17. (Original) The method of claim 15, wherein the step of delaying imparts a delay to a rising edge of the incoming signal.

18. (Original) The method of claim 17, wherein the step of delaying shapes the incoming signal to approximately a one bit time duration.

19. (Original) The method of claim 1, wherein the step of generating a first output signal and a second output signal comprises:

multiplying a delayed phase signal and the incoming signal to produce a second output signal.

20. (Original) The method of claim 1, wherein the step of generating a first output signal and a second output signal comprises:

filtering the first output signal and the second output signal.

21. (Original) The method of claim 1, wherein the step of generating a difference signal comprises:

multiplying a first quantized signal with the first output signal.

22. (Original) The method of claim 1, wherein the step of generating a difference signal comprises:

multiplying a second quantized signal with the second output signal.

23. (Original) The method of claim 1, wherein the step of generating a difference signal comprises:

calculating an algebraic difference between the first quantized signal and the second quantized signal.

24. (Original) The method of claim 1, wherein the step of generating a difference signal comprises:

filtering the difference signal.

25. (Original) The method of claim 1, wherein the step of quantizing the first output signal and the second output signal uses at least one multi-level quantizer.

26. (Original) The method of claim 25, wherein the at least one multi-level quantizer is selected from a group consisting of: a μ-law quantizer, a 4 level quantizer, a 8 level quantizer, and a 16 level quantizer.

27. (Original) The method of claim 1, wherein each of the plurality of ultra-wideband pulses has a duration ranging from about 10 picoseconds to about 1 millisecond.

28. (Original) The method of claim 1, wherein each of the plurality of ultra-wideband pulses has at least one of a phase and an amplitude that conveys data.

29. (Currently amended) An ultra-wideband receiver, comprising:

a receiver structured to receive an incoming signal, wherein the incoming signal comprises a plurality of ultra-wideband pulses;

an approximator structured to approximate the incoming signal;

a local signal generator structured to generate a local signal;

an output signal generator structured to generate a first output signal and a second output signal;

a quantizer structured to quantize the first output signal and the second output signal to produce a first quantized signal and a second quantized signal;

a difference signal generator structured to generate a difference signal [[for]] from the first quantized signal and the second quantized signal; [[and]]

an error provider structured to provide an error signal based on the difference signal filtered[[.]]; and

an output signal generator.

30. (Original) The ultra-wideband receiver of claim 29, wherein the local signal generator uses a phase-locked loop.

31. (Original) The ultra-wideband receiver of claim 30, wherein the phase-locked loop is gated.

32. (Original) The ultra-wideband receiver of claim 31, wherein the phase-locked loop is gated by the incoming signal.

33. (Original) The ultra-wideband receiver of claim 30, wherein the output generator comprises:

a local signal filter that produces a first duplicate signal and a second duplicate signal.

34. (Currently amended) The ultra-wideband receiver of claim 33, wherein the local signal filter comprises at least one [[a plurality of]] low-pass [[filters]] filter.

35. (Canceled)

36. (Currently amended) The ultra-wideband receiver of claim 34 [[35]], wherein a [[the]] cut-off frequency of the at least one low-pass filter is approximately 3 gigahertz.

37. (Original) The ultra-wideband receiver of claim 33, wherein the local signal filter comprises a matched filter.

38. (Original) The ultra-wideband receiver of claim 37, wherein the matched filter comprises a band-pass filter.

39. (Original) The ultra-wideband receiver of claim 38, wherein a passband of the band-pass filter is approximately 3 gigahertz.

40. (Original) The ultra-wideband receiver of claim 39, wherein a center frequency of the passband is approximately 5 gigahertz.

41. (Original) The ultra-wideband receiver of claim 38, wherein a transfer function of the bandpass filter approximates a transfer function of an ultra-wideband transmitter transmitting the incoming signal.

42. (Original) The ultra-wideband receiver of claim 29, wherein the output generator comprises:

a first multiplier that multiplies the first duplicate signal and the incoming signal to produce a first output signal.

43. (Original) The ultra-wideband receiver of claim 29, wherein the output signal generator comprises:

a phase delayer that delays a phase of the second duplicate signal to produce a delayed phase signal.

44. (Original) The ultra-wideband receiver of claim 43, wherein the phase delayer is selected from a group consisting of: a 90-degree phase delay circuit, and a 270-degree phase delay circuit.

45. (Original) The ultra-wideband receiver of claim 43, wherein the phase delayer imparts a delay to a rising edge of the incoming signal.

46. (Original) The ultra-wideband receiver of claim 45, wherein the delay shapes the incoming signal to approximately a one bit time duration.

47. (Original) The ultra-wideband receiver of claim 29, wherein the output signal generator comprises:

a second multiplier that multiplies the delayed phase signal and the incoming signal to produce a second output signal.

48. (Original) The ultra-wideband receiver of claim 29, wherein the output signal generator comprises:

an output signal filter that filters the first output signal and the second output signal.

49. (Original) The ultra-wideband receiver of claim 29, wherein the difference signal generator comprises:

a third multiplier that multiplies a first quantized signal with the first output signal.

50. (Original) The ultra-wideband receiver of claim 29, wherein the difference signal generator comprises:

a fourth multiplier that multiplies a second quantized signal with the second output signal.

51. (Original) The ultra-wideband receiver of claim 29, wherein the difference signal generator comprises:

a difference calculator that calculates an algebraic difference between the first quantized signal and the second quantized signal.

52. (Original) The ultra-wideband receiver of claim 29, wherein the difference signal generator comprises:

a difference signal filter that filters the difference signal.

53. (Original) The ultra-wideband receiver of claim 29, wherein the quantizer uses a multi-level quantizer.

54. (Original) The ultra-wideband receiver of claim 53, wherein the multi-level quantizer is selected from a group consisting of: a μ-law quantizer, a 4 level quantizer, a 8 level quantizer, and a 16 level quantizer.

55. (Original) The ultra-wideband receiver of claim 29, wherein each of the plurality of ultra-wideband pulses has a duration from about 10 picoseconds to about 1 millisecond.

56. (Original) The ultra-wideband receiver of claim 29, wherein each of the plurality of ultra-wideband pulses has at least one of a phase and an amplitude that conveys data.

57. (Currently amended) A system of demodulating ultra-wideband communications comprising:

means for receiving an incoming signal, wherein the incoming signal comprises a plurality of ultra-wideband pulses;

means for approximating the incoming signal;

means for generating a local signal;

means for generating a first output signal and a second output signal;

means for quantizing the first output signal and the second output signal to produce a first quantized signal and a second quantized signal;

means for generating a difference signal [[for]] <u>from</u> the first quantized signal and the second quantized signal; and

means for providing an error signal based on the difference signal.